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Original Articles.

CLINIC ON THE DIAGNOSIS AND TREATMENT OF NEUROSYPHILIS.*

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IT will be my endeavor to present some of the problems of syphilis as seen by the neuropsychiatrist. These will represent chiefly, of course, the syphilitic involvements of the central nervous system.

There are innumerable classifications of syphilis of the central nervous system, or, as we prefer to say, neurosyphilis. These classifications differ according to whether they are based upon the pathology, the clinical symptoms, or the stage of the disease in which the involvement of the nervous system occurs. A long period of therapeutic endeavor has shown that there are two distinct types of neurosyphilis: First, that which is very satisfactory to treat; the second, that which is relatively recalcitrant to treatment. The first group of cases, those which react very satisfactorily to antisyphilitic treatment, include those cases spoken of as cerebral syphilis, cerebrospinal syphilis, syphilitic meningitis, and so on. The second group is represented chiefly by the diagnoses of general paresis and tabes dorsalis.

Modern experience is in agreement with the experience of former days, in that we can recognize a group of cases which offer the most satisfactory therapeutic results to be found anywhere in the practice of medicine, and those cases which are so difficult to improve or help that they are the bugbear of the physician.

In a general sort of way, the stage of the disease in which the involvement of the central nervous system occurs has a certain prognostic significance. Those cases occurring during the early secondary stage of the disease are exceedingly satisfactory to treat. The difficult cases,—paresis and tabes,—are prone to occur ten to thirty years after the original infection. However, there are many cases of simple meningeal involvement which occur at this late period also, and the symptoms, although most striking and most fearful to see, may be made to disappear easily and satisfactorily.

To the neuropsychiatrist, syphilis appears as a very different disease from that which is ordinarily seen in a dermato-syphilogical clinic. Practically every case seen by the neuropsychiatrist presents a very serious problem for the life, mentality, or usefulness of the patient.

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There is no more dangerous condition than general paresis, not excepting carcinoma. There is nothing more terrible, more debilitating, nothing that causes more suffering and disability, than tabes dorsalis. Cerebral thrombosis, hemiplegia, brain gumma, and the fulminating types of syphilitic meningitis, jeopardize the life and usefulness of the patient in every instance in which one of these conditions occurs.

Let us contrast this with what is seen in the early stages of syphilis. Looking at the early period of syphilis,—the primary or secondary stages,—from the viewpoint of the neuropsychiatrist, the symptoms of these stages look very innocuous and unimportant. Their importance would seem to lie in what is going to happen in the future, not in what is likely to occur in the present. It is recognized that there is an occasional severe primary lesion leading to phagedenic ulcerations, that the prostration may be quite severe, and that the secondary stage may produce rather serious rupial lesions. Even these conditions are very infrequent, occur in but a very small percentage of the cases, and even if they do occur, modern treatment nearly always has such very quick and wonderful results that the whole affair does not seem to be of the same significance as paresis or tabes or hemiplegia. And so the vast majority of the tertiary symptoms, referable to the skin or to the bones, even when unpleasant or painful, do not affect life or the patient's utility in the world. They, again, react very satisfactorily to treatment. On the other hand, there may be visceral involvement which is just as important and dangerous as the nervous system involvement. We refer to the cardiovascular, cardiorenal, hepatic, pancreatic, pulmonary, and alimentary tract involvement. Thus when the neuropsychiatrist is confronted with a case of syphilis that is syphilis of the central nervous system he is face to face with a serious problem. Every case that he sees appears to him to be an accusing finger pointing to some member or members of the medical profession, who have somewhere, sometime, or somehow failed to do their duty by that case. It does not follow that every accusation, or every indictment, can lead to a moral conviction. Many of the neurosyphilitic cases give no history of syphilitic infection, either by name or by symptoms. Yet the majority of these patients have been in the hands of a physician who might have made a diagnosis of syphilis, especially with the aid of a Wassermann test. Again, many a patient whom we see late has failed or refused to follow the correct advice given by the physician who saw him in the early stages of the disease. Still it is not altogether unfair to say that some blame attaches itself to a medical situation that does not provide for a satisfactory follow-up on these cases. There is yet another large percentage of the patients who have been told by their attending physician that they were cured or needed no further treatment, and who later cast much useless blame upon the man who did not direct them rightly. Ten to fifteen or twenty years ago, it was not possible to tell a patient whether or not it was safe for him to go on without further treatment. It is perhaps more possible at the present day to advise a patient correctly as to his future course, and it is certainly more easy to learn whether or not the central nervous system itself is involved, and this better strategic position of the physician as an adviser is due to the lumbar puncture and the Wassermann test. To the neuropsychiatrist, the lumbar puncture is what the urine examination and blood examination, the x-ray picture, and the blood pressure are to the internist. And the lumbar puncture is all this to us, because syphilis is such a large factor in the practice of neuropsychiatry. About 10% of all the cases of mental disease seen by the neuropsychiatrist are directly due to syphilis; 30 to 50% of all cases seen in a neurological clinic are due directly to syphilis, and about 10% of all cases of syphilis develop a frank, serious involvement of the central nervous system.

It is necessary to briefly review the place taken by the spirochaete in the involvement of the nervous system. Beginning with the primary stage of the disease, it is recognized that there is a generalized involvement of the entire system of the individual. This includes, in all probability, the central nervous system itself. Numerous studies of the cerebrospinal fluid in cases of primary syphilis have shown evidence of spirochaetal invasion. Thus, Wile and Stokes (*Journal American Medical Association*, 1915, LXIV, p. 979) studied six cases of primary syphilis. They found that in three cases there were slight changes in the spinal fluid, indicating an involvement, while the fourth case showed marked change. Dennie and Smith (*American Journal of Syphilis*, 1918, II, No. 1, p. 101) found slight abnormalities in the spinal fluid in 35%, and more marked abnormalities in 20%.

In the secondary period of the disease there is even more evidence of the presence of the spirochaetes in the nervous system. The characteristic and well-recognized headaches of this period are, in all probability, due to meningeal involvement. Gennerich ("Die Liquorveränderung in den Eingelnen Studien über Syphilis," Berlin 1913) states that 90% of the cases whose spinal fluid was examined in the secondary period showed definite abnormalities of the fluid findings. Ravaut (*Ann. de Dermat. et de Syph.*, 1903, s. IV, page 1) gives the percentage of spinal fluid abnormalities as 67. Dennie and Smith (*loc. cit.*) report 35%.

Even more interesting is the result of animal inoculation. Marinesco and Minea (*Acad. de Sc. Sem. Mep.*, 1914, page 357) showed by animal inoculation that spirochaetes were present in the spinal fluid obtained from cases in the primary stage, although there was no clinical evidence of a nervous system involvement. Hoffman (*Derm. Ztsch.*, 1906, VIII, page 561) obtained similar results with spinal fluid obtained from cases in the secondary period of the disease.

In the vast majority of cases, the involvement during the primary and secondary stages is of relatively small importance, at least for the time being. With or without treatment, it is the rule for the symptoms to disappear, much as the secondary rash disappears. This disappearance of symptoms is more certain and more rapid with treatment than without treatment. In a rather small percentage of the cases, however, serious damage occurs in the secondary period of the disease in the form of meningitis, meningoencephalitis, and thrombosis or break of the cerebrospinal vessels. The overwhelming majority of cases of serious neurosyphilitic involvement occurs much later in the course of syphilis,—10, 20, 30, or even 40 years after the primary lesion. There is a large gap in our knowledge concerning the reason why certain cases of syphilis develop central nervous system lesions, and why others go through a long period of life without any disturbance. This is quite similar to what happens to the body at large. There are those cases of syphilis which, even without treatment, apparently run a benign course, and do not in any way disturb the patient's health or life. Numerous theories have been evolved endeavoring to explain why a certain group of syphilitic cases develop central nervous system lesions. One theory has it that there is a special strain of the spirochaetes having a predilection for the central nervous system. This hypothesis is supported by the following facts: A great number of cases are now on record where several people infected from the same source all developed syphilis of the brain or cord. It is not unusual to find tabes or paresis in both the wife and husband, and to find children of this couple having juvenile cerebrospinal syphilis of one form or another. It has further been shown by Reasoner and others that spirochaetes obtained from the cerebrospinal fluid of paretics have a tendency to produce central nervous system lesions in rabbits, whereas spirochaetes obtained from chancres or skin lesions do not tend to invade the nervous system in the same species of laboratory animal. Another theory has it that the tendency to nervous system invasion depends upon the constitution of the individual affected. Evidence has been brought to show that persons of so-called neuropathic constitution, when infected with syphilis, are prone to develop disease of the nervous system. It would seem, according to this reasoning, as if the barriers or defences which normally isolate the nervous system have been defective, and are easily broken down. Edinger, in his "Ersatz Theorie," has attempted to show that excessive use of a portion of the nervous system is likely to determine the invasion of that part. Thus, a mail-carrier would be prone to develop tabes, whereas a philosopher, Nietzsche, for example, would be more likely to develop paresis. We have seen, however, that the vast majority of persons infected with syphilis have their central nervous systems invaded by the organisms. Swift has used this evidence to devise the idea that in the cases that develop severe central nervous system involvement there occurs a hyperallergic reaction; in other words, that in the early invasion there has been produced a sensitization of the tissue and that later by some accidental flare-up, a few spirochaetes again make their way to the central nervous system, and in this previously sensitized tissue cause a tremendous reaction. Any or all of these theories may play a rôle in the production of the serious manifestations. It seems to me, however, that in a large percentage of cases, the spirochaetes have been active in the nervous system off and on for a large proportion of the time following the primary invasion and it is only because the progress has been slow or the defence of the host fairly good that no symptoms have resulted. This hypothesis has the advantage of keeping our attention upon the central nervous system throughout the course of the disease, and if accepted, offers the suggestion for examination of the cerebrospinal fluid for evidence of inflammatory reaction.

This leads to our main thesis, namely, that every case of syphilis is to be considered from the standpoint of the affection of the nervous tissues. It needs no argument to sustain the statement that our best endeavors should be directed towards the prevention of the involvement of the nervous system, rather than the cure of the condition after it has become advanced; and hence, the interest of the neuropsychiatrist in syphilis from its incipiency until the death of the person affected. It is the business of every physician to prevent the neuropsychiatrist from entering into professional relations with a syphilitic patient, by preventing any symptoms that would bring the patient to the neuropsychiatrist. It is true that in the past, when mercury and iodides were the doctor's only specifics for syphilis, certain cases developed paresis, tabes, and cerebrospinal syphilis after what was considered thoroughly adequate treatment. Fournier, and Mattauscheck and Pilcz have presented adequate evidence to show that the better the treatment the less the probability that the patient will develop nervous manifestations. Just how much better the results will be with the use of arsphenamine in addition to mercury and iodides, it is not at present possible to state, but all expectation is that they will be infinitely more satisfactory.

In the remaining portion of the time, attention will be directed to those cases which, by some unfortunate circumstance, have developed neurosyphilis. The methods and results of treatment will be indicated. It is also pertinent to draw attention to the fact that in order to follow perfectly any case of syphilis through its treament course, a lumbar puncture and examination of the spinal fluid is essential. On this point there can be no doubt, and the following cases will focus the attention upon lumbar puncture and examination of the fluid.

The main types of neurosyphilis occurring in the secondary period are the acute meningitis and meningoencephalitis, and the vascular cases.

CASE 1. Meningitis or Meningoencephalitis in the Secondary Period: Mr. Fred C. was a man 49 years of age, who developed a primary lesion in July, 1915. Shortly after the appearance of the primary sore, he was put on treatment consisting of injections of mercury, and potassium iodide by mouth. He had four injections of salvarsan. In December of the same year, that is about five months after the appearance of the primary sore, he had a convulsion. He went to work the following day, but was reported as acting strangely and not able to work. He had a second convlusion, complained of very severe headache, was quite somnolent, on one occasion sleeping for twenty hours. He was brought to the Psychopathic Hospital on the third of January, 1916.

At this time he was found to be dull and lethargic: there was no emotional reaction; he failed to recognize the physician who had been treating him when the physician called upon him in the hospital. Aside from having no control of his sphincters, which was apparently a psychic phenomenon, the neurological examination was entirely negative. The examination of the blood showed a strongly positive Wassermann reaction. The spinal fluid also gave a strongly positive Wassermann reaction. There were 41 cells per cmm., globulin 3+, albumin 4+, gold sol 5555555310, the so-called paretic reaction. This was a case of neurosyphilis of the meningitic or meningoencephalitic type, occurring in the secondary period of the disease, characterized by convulsions, mental hebetude and confusion. It should be noticed that the neurological examination in this case was essentially negative, thus emphasizing the fact that many cases of neurosyphilis do not show physical signs which permit the diagnosis of nervous system involvement. An examination of the spinal fluid was of the utmost diagnostic importance. The patient was immediately put upon arsphenamine injections. He received two injections a week, the average dose being .6 of a gram. At the end of four weeks, that is, after about eight injections of arsphenamine, his spinal fluid was essentially negative, and he was symptomatically recovered. In a very short time his blood Wassermann also became negative, and now after a period of four years, he is symptomatically well. His blood and spinal fluid were last examined in April, 1919, and were negative.

CASE 2. Meningitis of the Secondary Period: James S. was a young man 28 years of age. He gave a history of a chancre in August, 1916, followed by a secondary skin eruption.

He had four injections of salvarsan and three of mercury, receiving the last injection of salvarsan in December. About this time he began to complain of severe headache and some pain and stiffness in the neck. Two weeks later dizziness became prominent, and in another week he complained of difficulty in hearing. Shortly after this progression of symptoms, he suddenly became very excited, then entirely delirious. He was brought into the hospital in a confused, delirious state in January, 1917, about five months after his chancre. The symptoms were those of an acute meningitis. There was stiffness of the neck, retraction of the head, and Kernig's sign. The pupils were unequal. The Wassermann reaction was positive on the blood and spinal fluid. There were 228 cells per cmm. Globulin was reported 4+, albumin 4+, and the gold sol reaction 5555542100. He was immediately put under treatment, made a very rapid clinical improvement, and was allowed to return home in eight days. Treatment was continued. A month later another spinal puncture showed that the Wassermann was somewhat weaker in the spinal fluid; there were but 35 cells per cmm., globulin 2+, albumin 2+, gold sol reaction 4222210000. He had sixteen injections of arsphenamine, approximating .6 gram each, during a period of three months. He then left the state, and had no treatment except mercury by mouth for the next year. He was again seen a year after his first appearance at the hospital. He was symptomatically well, and the blood Wassermann reaction was negative. The spinal fluid was not obtained. Despite the negative Wassermann reaction of the blood and the excellent clinical condition of the patient, this case cannot be considered adequately followed, because the condition of his spinal fluid was not obtained. It is highly possible that this might be positive and then further treatment would be indicated, preferably intraspinous. Even if it were negative, he should have further fluid examinations at intervals of about a year. We know from experience that a negative fluid may be found positive at a later date.

CASE 3. Vascular Neurosyphilis of the Secondary Period: This case is illustrative of the vascular lesions of the secondary period. The patient was a young man 28 years of age, who was brought into the Psychopathic Hospital on July 4, 1915, in a delirious condition, with evidence of a left hemiplegia. The history is dramatic and illuminating. Some three months previous to his admission, he had developed a sore on his lip which was diagnosed as a chancre. He was given treatment by mouth only. He began to complain of headache and dizziness. As he did not seem to improve, he changed to another clinic, where the diagnosis of syphilis was again made, and a date given for the injection of arsphenamine. Upon reporting for his treatment, he was told that on account of the shortage of salvarsan,—this being the period when salvarsan was difficult to obtain and before we were being supplied with the American-made drug,—he would be given other treatment and the salvarsan would be kept for the more infectious cases. A few days later he had an apoplectic attack which brought him into the hospital. The general symptoms of a left hemiplegia, with confusion, delirium, loss of sphincter control, and the like, were present. The Wassermann reaction was positive in the blood and spinal fluid. There were 176 cells per cmm., globulin 3+, albumin 3+. Treatment was at once instituted. The patient was given semi-weekly injections of salvarsan, weekly injections of mercury salicylate, and potassium iodide by mouth in doses of 100 grains three times a day. He remained stuporous for about two weeks and then improved. The spinal fluid began to clear up after about 2½ months of treatment, and a year later was entirely negative. The patient, however, was left with a residual hemiplegia. Mental recovery was complete. The results of therapy were all that could be expected in this case,—an apparent complete sterilization of the process, negative blood and spinal fluid, and complete clinical improvement except for the residual defect. Our only regret is that treatment was instituted too late. If it had been instituted before the stroke, he would, presumably, have cleared up without any defect. The chief point to be made is that here was an indication for lumbar puncture,—headache and dizziness,—which was entirely overlooked because of the stage of the disease, *i.e.*, early secondary period.

At times it is not possible to get a history of syphilis and one must depend upon the clinical signs and the laboratory findings, especially the spinal fluid examination, to make the diagnosis.

CASE 4. Fainting Spells Due to Neurosyphilis: Margaret Mc. was a girl 28 years of age, who came to the clinic because of fainting spells. These had persisted for some months and had been treated lightly by her physician, as merely feminine fainting attacks. The history brought out the significant fact that following several of these attacks she had been aphasic. The physical examination, both as to viscera and the neurological findings, was entirely negative. She could give no history of syphilitic symptoms. However, the blood and spinal fluid gave strongly positive Wassermann reactions. Under antisyphilitic treatment, the seizures disappeared and the patient rapidly gained in weight and in general health. In fact, after eight injections of arsphenamine given in a period of one month, the spinal fluid became entirely negative. The Wassermann reaction remained positive, however, and on this account, she received courses of treatment during the next three years. It was not possible, however, to obtain a negative blood Wassermann. She has continued in the best of health.

In the foregoing cases, the absence of definite neurological symptoms has been emphasized, and the fact that a lumbar puncture was essential in order to prove definitely the involvement of the nervous system. It may be argued, however, that in practically all of these cases there were symptoms which should have attracted the attention to the nervous system. In the two following cases, however, there were no symptoms or signs leading to suspicion of the nervous system.

CASE 5. "Latent Neurosyphilis": Mary McG. was a girl 20 years of age, who had led a fairly riotous life. She was under the charge of the Girls' Parole Department, and because of their inability to keep her on the straight and narrow path, was sent to the Psychopathic Hospital for examination. The routine Wassermann examination was reported positive. She gave no history of primary or secondary symptoms and, as indicated above, her physical examination, including the neurological, was essentially negative. As a matter of routine in a syphilitic case, a lumbar puncture was performed, which disclosed a strongly positive Wassermann reaction; globulin 1+, albumin, 1+, 132 cells per cmm., gold sol 4443333221. Sixteen injections of arsphenamine in the following four months were given, and at the end of this time she had a negative blood Wassermann and a negative spinal fluid Wassermann; globulin and albumin were still reported as 1+; there was one cell per cmm., and the gold sol reaction was 4332221100. Treatment was continued, and 11 more injections of arsphenamine were given in the following nine months. After a rest of seven months, another lumbar puncture was performed, which was entirely negative, as was the blood reaction.

CASE 6. Latent Neorosyphilis—*"Paresis sine Paresi"*: A somewhat similar case is that of Grace T. This patient was the wife of a paretic, which fact, in our minds, was sufficient reason for making a complete examination. This examination, as far as the physical and neurological findings were concerned, was entirely negative. However, she had a positive blood Wassermann. This lead to a lumbar puncture which disclosed a strongly positive reaction; globulin 1+, albumin 1+, 34 cells per cmm., and a paretic type of gold sol reaction: 5522211100. We are of the opinion that this woman was on her way to develop the same condition as her husband, namely, general paresis. This is an illustration of the type of case on which the theory of a central nervous system strain of spirochaetes is developed. Whether or not we will be able to hold this case in check by antisyphilitic treatment, it is not possible to prognosticate, owing largely to our paucity of knowledge as to the course of such a case if untreated. This case calls attention to the hypothesis which I hold, namely, that the spinal fluid will show evidences of pathology long before the patient develops symptoms of tabes or paresis. A number of instances of this sort have come to our attention.

The above mentioned cases have all illustrated not only the advisability of lumbar puncture, but in some instances the absolute need of such a puncture if we are going to do justice to the patient. These cases (with the possible exception of the last, which has not been under observation a sufficient length of time to allow one to draw conclusions from it) have shown the very satisfactory results that may be obtained in certain types of syphilis of the nervous system. These results were obobtained by intravenous and intramuscular injections, without the aid of intraspinous therapy. There are, however, cases occurring even in the early stage of the disease which are not so amenable to treatment, and hence far from being so pleasant to treat.

CASE 7. Early Neurosyphilis Recalcitrant to Treatment: Jeremiah C. was a most industrious man of 37 years of age, and very ambitious. He was a postal clerk working from 8 in the evening until 3 in the morning, and attending medical school from 9 to 5. In his second year at the medical school, he acquired a primary lesion. Treatment was begun in the early secondary stage. For something over a year, he received weekly injections of mercury. Six months after the primary stage he received one injection of arsphenamine. His original infection occurred toward the middle of 1914. We saw him early in 1917, that is, less than three years after the primary infection. At this time a diagnosis of general paresis was made by the physician who had been treating him. This was made chiefly upon the mental symptoms. He had lost his ability; could not concentrate; was irritable, very emotional, crying at various periods of the day; fearful, unable to go about alone. His calculating ability was extremely poor. His memory was defective. The physical examination showed very little, except what was considered as a sluggishness of his pupillary reactions. He did have a noticeable speech defect. The Wassermann reaction on the blood serum was strongly positive. The spinal fluid also gave a strongly positive Wassermann reaction; globulin 2+, albumin 2+, 8 cells per cmm., a paretic gold sol reaction: 5554332100. From May, 1917, to January, 1919, he received

83 injections of arsphenamine and a few injections of mercury, as well as a considerable quantity of potassium iodide by mouth. At the present time his physical condition is the same as when originally examined. He is working as a bookkeeper and doing fairly well. The serological examination, however, is very distressing. The Wassermann reaction is strongly positive in both blood and spinal fluid. There are 23 cells per cmm.; globulin 1+, albumin 1+, gold sol reaction 5544310000. Since July, 1919, he has received six intraspinous injections, chiefly because of the spinal fluid findings. These have not been improved, however, by this treatment. This case is one of early nervous system involvement which has not shown serological improvement under rather strenuous treatment.

It is only fair to point out that there are a few cases which from the early stages of the disease receive treatment that is adequate for the majority of cases of syphilis, yet they do poorly, and may even develop paretic neurosyphilis.

CASE 8. Development of Paresis Despite Early Treatment: Edward S. was 28 years of age when he first came to the Psychopathic clinic. He showed the signs of a fairly well advanced paresis. There was inequality of the pupils with poor reaction. The speech defect was marked. The tendon reflexes were all very lively. The blood and spinal fluid were positive to the Wassermann test; globulin 3+, albumin 3+, 34 cells per cmm., and a paretic type of gol sol reaction: 5555431000. Mentally he was quite apathetic and showed memory and judgment disorder. He had deteriorated considerably. The history showed that he had acquired syphilis about six years previously, at the age of 22. He had at once placed himself in the hands of a good medical man, and had received constant treatment since that time in the form of numerous salvarsan injections, mercury by injection and inunction, and potassium iodide. Despite this treatment, he had developed a definite paretic state. Whether any more vigorous treatment would have staved off this condition is, of course, difficult to say. At any rate, he had developed paresis six years after his infection, despite what is ordinarily considered very adequate treatment, and treatment prolonged much longer than is usual. Very intensive treatment from the time of his appearance at our clinic has not succeeded in producing any real improvement. Something over three years has now elapsed, and he is more dilapidated and deteriorated than when first seen.

Late neurosyphilis again may be considered from the standpoint of therapeutic results. There are cases which do very well and others in which results are not satisfactory. In a general way, this therapeutic division runs parallel to the pathology,—the cases which do well being, on the whole, those in which the lesions are chiefly related to meninges; whereas, those with parenchymatous degeneration are the ones that do poorly. The first group, those giving rather universally successful therapeutic results, represent the cases giving a clinical diagnosis of cerebrospinal syphilis or gumma. The unsatisfactory ones are usually considered under the headings of general paresis, tabes, or vascular neurosyphilis. The late cases, like the early ones, may show comparatively little on physical examination, and again require the aid of the lumbar puncture to establish a correct diagnosis.

CASE 9. Therapeutic Results in Meningitis or Meningoencephalitis Occurring in the Late Period: James S. consulted us in his forty-sixth year. For some four or five months he had been feeling badly. He was unable to sleep nights and complained of a general weakness. He stated that he was unable to concentrate his mind on his work, often discarding a job before it was finished. He was suffering from headaches and had become exceedingly irritable. His general intellectual processes were all slow. Physical examination was essentially negative, as was the neurological. The patient, however, gave a history of syphilitic infection twenty years previously. He had been treated for this during a period of three years and then informed that he was cured. The Wassermann reaction was positive on the blood and spinal fluid; globulin 1+, albumin 1+, 36 cells per cmm., and a weak gold sol reaction: 0012343100. This patient had been thoroughly convinced that there was no hope for him and that he would undoubtedly go the way of paresis. Intensive intravenous treatment, assisted by a couple of intraspinous injections, produced a most satisfactory result. The patient became symptomatically well, and now has a negative blood and spinal fluid. We would again emphasize that there was nothing in the physical examination to suggest neurosyphilis. It was rather significant to note that in this case only one positive Wassermann was obtained on the blood serum. After two injections of arsphenamine, the Wassermann became negative and remained so. There are many cases of neurosyphilis in which the blood Wassermann reaction is negative.

CASE 10. Therapeutic Results in Meningitis or Meningoencephalitis Occurring in the Late Period. The case of Frank M. is somewhat similar to the preceding, with the addition of symptoms relating to the spinal cord. The patient was a man 46 years of age. He admitted a primary infection twenty years before, for which he received only local treatment. For the past three years he had been complaining of localized pain over the back which was fairly constant. In addition, he had what was called rheumatism. For these conditions he had received treatment from various physicians without help. Recently he began to have slight headaches, lacked concentration, was irritable, ill-tempered, and felt "all in." In his case, as in the preceding, the physical and neurological examination showed nothing of note. He had, however, a positive blood and spinal fluid Wassermann, 56 cells per cmm., globulin and albumin in excess, and a mild gold sol reaction: 0011332110. Intravenous arsphenamine had an almost miraculous effect. The pains of which he had been complaining for several years disappeared after the second injection and there has been no recurrence of them for the succeeding year and a half. He now feels entirely normal. The spinal fluid has shown a similar improvement, but is not negative, as the Wassermann is very slightly positive and the gold reaction still positive.

These two cases represent the very satisfactory results that may be obtained in late neurosyphilis of a certain type. It must be borne in mind that these are the cases which have always been recognized as reacting very satisfactorily to antisyphilitic treatment. They are the meningitic types.

The vascular type of neurosyphilis, whether seen in the early secondary stage or late in the disease, is much less satisfactory in many ways, chiefly because of the damage which is likely to occur from thrombosis or hemorrhage, which causes an irreparable destruction of tissue. However, many of these cases can be greatly benefited, at least in so far as preventing a continuation of the destructive processes.

CASE 11. Vascular Neurosyphilis of the Late Period: George F. admitted a syphilitic infection 17 years before he was seen at the clinic. Until just before we saw him, he had been entirely well. There had been no symptoms of any sort to bring him to the attention of the physician. His was an apparently benign case, but this benignancy was apparent rather than real. Syphilis was at work, although not recognized. In October, 1916, he suddenly had a shock, resulting in left hemiplegia. The blood and spinal fluid were positive to the Wassermann test. There was pleocytosis, globulin and albumin in excess, and a positive gold reaction in the spinal fluid. The spinal fluid became normal after about 18 months of continuous treatment. The blood remained positive during more than three years of continuous and intensive treatment, but has finally become negative. The man, however, is left with a residual hemiplegia, and without question has pathological changes in his cerebral vessels. However, three and a half years have elapsed since his shock and he has had no new trouble. It may be pointed out that cerebral arteriosclerosis of syphilitic origin is no contra-indication of antisyphilitic treatment of arsphenamine or mercury. This man, as many others of our patients with cerebral arteriosclerosis or vascular changes, has been subjected to intensive and long continued arsenic and mercury therapy, and has shown marked improvement as a result, with no untoward symptoms from the use of these drugs.

The treatment of tabes and paresis is a much more difficult and less satisfactory matter. Until the introduction of salvarsan, the vast majority of physicians considered these diseases as entirely hopeless as far as any therapeutic interference was concerned. Since the introduction of salvarsan and the intraspinous technic of Swift and Ellis, much attention has been paid to tabes, and, in my opinion, with very satisfactory results. It seems to me that there can be no gainsaying the fact that many cases of tabes and paresis are markedly improved by therapy. In some cases intravenous injections of arsphenamine are sufficient to produce very satisfactory results. Other cases, which do not do well under this form of treatment, respond quite satisfactorily to the combination of intraspinous and intravenous theropy. There are still a goodly number of cases, especially of the paretic type, which do not show any improvement under our modern methods of treatment. Here, as elsewhere in medicine, so much depends upon an early correct diagnosis. If one is able to obtain the cases of tabes in the early period, sometimes good results are to be expected. Later, the results are less favorable, but even in the so-called paralytic stage of tabes one at times sees the most gratifying and striking improvement.

(To be continued.)

A CONTRIBUTION TO THE KNOWLEDGE OF CYSTS OF THE JAWS.

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CYSTS are of comparatively frequent occurrence, in both the maxilla and mandible. They usually escape notice until they have attained large proportions, and even then are not always discovered. The teeth involved are often treated for peridental abscess, or pulp disease, before a correct diagnosis is made.

Two types of bone cysts may be distinguished. One, originating from the dental follicle, is called a *follicular cyst;* the other, resulting from a so-called blind abscess or granuloma, at the root apex of an infected tooth, is termed a *radicular cyst.*

The *follicular* cyst is caused by abnormal development of a tooth follicle during the developmental stage of the tooth. It occurs most frequently in connection with a misplaced unerupted or supernumerary tooth. It may, however, be formed from the enamel organ without a tooth being developed. If the cyst contains a tooth it is called *dentigerous.* (Figures 4 and 5.) More than one tooth, either well formed or rudimentary, may be found in a cyst. Sometimes only masses of calcified tooth particles are produced, and these may be composed of enamel, dentine, cement or dental pulp; also occasionally of bone. Calcified tissue, however, is not always formed, and microscopic examination may show a mass of enamel organs with cylindrical epithelial cells. Typical ameloblasts are sometimes developed and these may be found laying down enamel. This is spoken of as a *cystic adamantonoma.* Dentine and cement formation may also be seen, in which case the lesion is called a *cystic odontoma.* (Figures 6 and 17.)

The cyst sac is usually composed of a fibrous membrane, lined by epithelium, which may be in a single layer, stratified or epidermoid in character. The liquid contained in the sac is clear and straw-colored, originating principally from a secretion by the epithelial cells. Cholesterin crystals are usually present and, if infection takes place, the liquid is contaminated by pus.

The *radicular cyst* is of inflammatory, infectious origin and is developed from a blind abscess or granuloma, a chronic inflammatory lesion, which forms at the apex of an infected tooth. (Figure 1.) Epithelial rests, remnants from the enamel organ, are frequently found in the normal peridental membrane and, through irritating influences, such as those exerted by chronic inflammation, these are caused to proliferate, forming chains of epithelium, which grow like a net-work through the lesion. (Figure 18.) Having a tendency to grow between vital and necrosed tissue, the epithelium soon forms an entire lining of the abscess cavity. Accumulation of broken-down tissue and exudates causes extension of the cyst. It often grows to tremendous size at the expense of the bone, which disappears through pressure absorption. The bone may become so thin that a cracking sound can easily be heard on palpation.

In the upper jaw, cysts may encroach on the nasal cavity or develop inside the maxillary sinus, sometimes filling it almost completely, a condition which is very difficult to diagnose.* In the lower jaw they are found in the body of the mandible, as well as in the ramus. (Figures 14, 15 and 16.)

Radicular cysts sometimes have apparently no connection with a tooth root. (Figure 16.) In such cases the guilty tooth may have been extracted, the cyst having escaped notice at the time, or there may have been left in the jaw an epitheliated granuloma, which developed into a cyst later.

The cyst sac (Figure 19) usually has an epithelial lining of very simple nature, the underlying structure consisting of inflammatory granulation tissue of very fibrous composition, containing large numbers of lymphocytes and plasma cells and, nearly always, cholesterin crystals. The fluid usually looks like pus. Detached cholesterin crystals give it a characteristic appearance, the color varying according to the type of contamination.

SYMPTOMS.

Local symptoms, as a rule, are absent, in either type of cyst, up to a certain stage of the development. Just how long it remains unnoticed depends a good deal on its location and rapidity of growth, and upon accidental changes in the pathological development. Symptoms may appear as changes in the facial contour, such as swellings on the cheek or side of mandible, on the hard palate or under the lip. In extreme cases of the latter, the lips cannot be brought together at all. In one case, which came under the writer's observation, the patient noticed a sensitive spot on the skin of the cheek over the affected part, due to perforation of the bone at this point. Distention of the cyst is often evidenced by indefinable, obscure pressure, and occasionally causes displacement of some of the teeth. Pain is comparatively rare, but in two cases I have seen complete paresthesia of the lower lip, due to involvement of the inferior alveolar nerve. The lack of a tooth often leads the parent of a child to recognize that something is wrong. A cyst with an opening into the mouth is noticed by the discharge of its excretion, which causes a bad taste and a disagreeable odor in the mouth. Secondary infection, which occurs through the diseased pulp canal or pus pocket of an adjacent tooth, frequently causes symptoms of acute inflammation, such as we see in acute or subacute dental abscesses and, subsiding, may leave a fistula on the gum, which often leads to faulty treatment.

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* See Boston Medical and Surgical Journal, Vol. clxxix, No. 1, pp. 17-20, Fig. 20, July 4, 1918.

General symptoms are uncommon in cases of follicular cysts. The infectious type, which includes all radicular and secondarily infected follicular cysts, may be the cause of focal infection or general toxemia.

DIAGNOSIS.

As there is not always external evidence of this condition, and as the lesion may be developing for a long time before symptoms appear, it is generally difficult to make an early diagnosis. Cysts which cause changes in the visible surfaces of the jaws are generally more easily recognized than those encroaching on the nasal cavity or maxillary sinus. Differential diagnosis is easier in the upper jaw, where the characteristic parchment-like condition of the bone, producing a cracking sound on pressure, is much oftener found than in the lower jaw. Here the massive cortical plates present considerable resistance to absorption and outward extension of the lesion.

Distinguishing diagnosis must be made for a solid tumor, and this is best accomplished by puncturing the lesion at a convenient place with a strong, sharp needle, attached to a glass syringe and aspirating the liquid. It is, however, important to remember that sarcomata occasionally develop from the cyst sac.

Cysts which develop in the cavity of the maxillary sinus are hard to recognize and often present, on clinical examination, the same condition as that of maxillary sinusitis. In suppurating cysts with a sinus into the antrum, there may even be discharge through the osteum.

ROENTGEN DIAGNOSIS.

The discovery of cysts is now very often made in routine roentgen examination of the jaws, but in suspected cases it is absolutely essential to take pictures, both as an aid to differential diagnosis, as well as to get more exact information regarding the size, shape and location of the lesion. The roentgen picture will show the relation to the teeth and neighboring structures, such as the inferior alveolar canal, antrum and nose; it will disclose much of the causative factor and be a valuable guide for the operative technique. Figures 1, 2 and 3 show three roentgen films which are typical pictures of some of the conditions which should be distinguished from cysts; namely, ordinary chronic alveolar abscess, chronic granulating ostitis and chronic osteomyelitis.

The roentgen examination should be made on large films or plates, as the small ones seldom cover more than part of the lesion. The cyst cavity appears as a black area on the negative, because it decreases the resistance, which in normal bone conditions, is put in the way of the rays. The bone immediately surrounding the cavity, however, is cortical and dense, and so we find the typical picture of a cyst showing a light, but distinct surrounding line. This is well shown in Figures 4, 5, 6, 12 and 14. To diagnose cysts in the antrum, both frontal and side plates are necessary.

TREATMENT.

The principle of the treatment of both radicular and follicular cysts is essentially the same. The operation should be intraoral whenever possible, and radical enough to insure against a return of the trouble. After detaching the mucous membrane and periosteum, an opening, as large as possible, is made through the bone, removing one entire wall of the cyst, so as to expose the entire cavity. The writer always removes the cyst sac completely with all its contents, no matter what type is being dealt with. In the case of follicular cysts this is especially important as a preventative against recurrence. All unerupted teeth connected with and all devitalized teeth extending into the cavity should be extracted. In small cysts the bone cavity may be allowed to fill with a blood clot, but in larger ones a different procedure is necessary. After all sharp, ragged edges of bone are carefully removed, as much as possible of the inner wall of the bone cavity

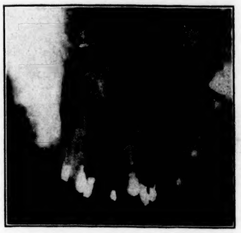

FIG. 1.—Chronic alveolar abscess.

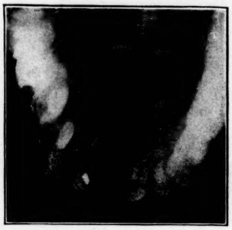

FIG. 2.—Chronic granulating ostitis.

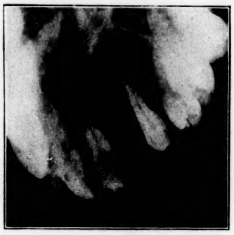

FIG. 3.—Chronic osteomyelitis.

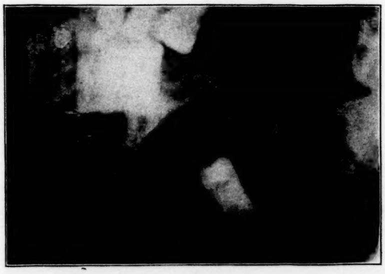

FIG. 4.—Dentigerous cyst in the lower jaw. Case of *Si.*

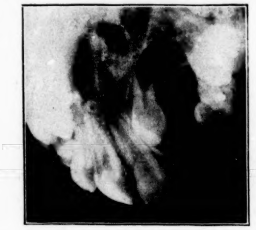

FIG. 5.—Dentigerous cyst in the upper jaw. Case of *W. W.*

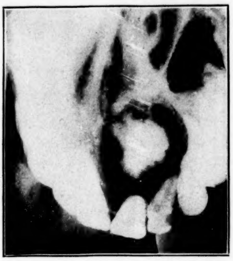

FIG. 6.—Cystic odontoma. Case of *R. W.*

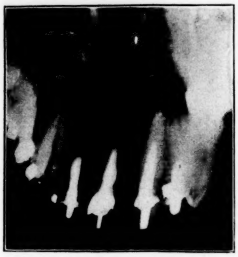

FIG. 7.—Radicular cyst in the upper jaw. Case of *M. E. H.*

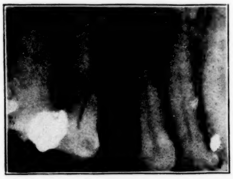

FIG. 8.—Small cyst in the upper jaw. Case of *I. A. H.*

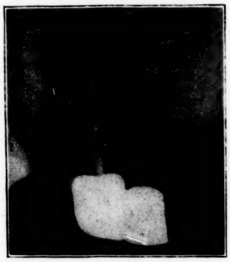

FIG. 9.—Small cyst in the upper jaw. Case of *H. H.*

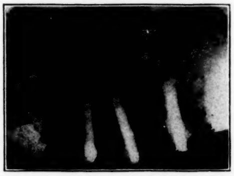

FIG. 10.—Small cyst in the upper jaw. Case of *G. H. H.*

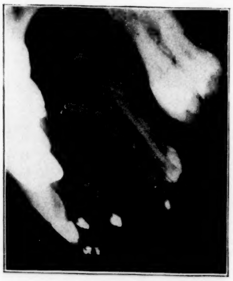

FIG. 11.—Large radicular cyst. Case of *H. G.*

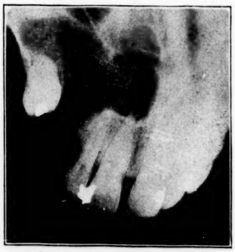

FIG. 12.—Large radicular cyst. Case of *C. E. B.*

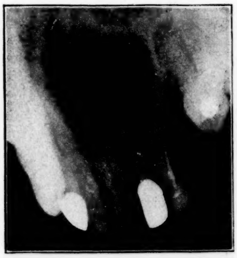

FIG. 13.—Large radicular cyst. Case of *N. L.*

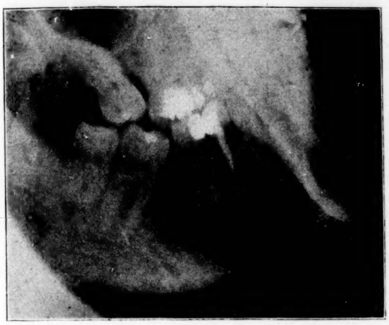

FIG. 14.—Large radicular cyst in mandible. Case of *J. T. G.*

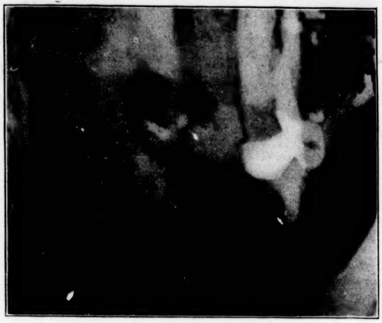

FIG. 15.—Large radicular cyst in mandible. Case of *J. C. F.*

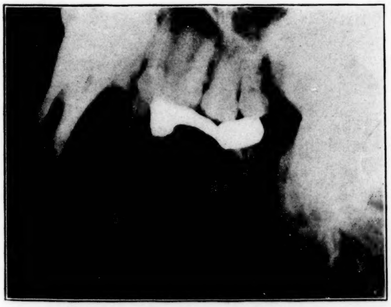

FIG. 16.—Large radicular cyst under a bridge in mandible. Case of *T. K.*

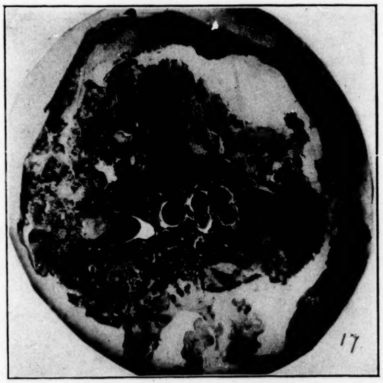

FIG. 17.—Photomicrograph of cystic odontoma shown in Fig. 6.

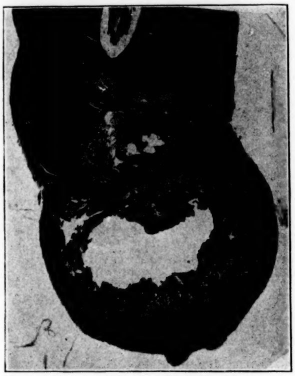

FIG. 18.—Photomicrograph of root apex with chronic abscess, showing proliferation of epithelium.

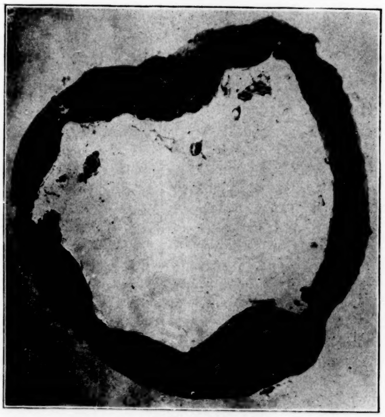

FIG. 19.—Photomicrograph of cyst sac from a radicular cyst.

is covered with the flap of mucous membrane and held there by a packing of iodoform gauze. This is removed after forty-eight hours and the cyst cavity then forms part of the mouth. The wound is soon entirely covered by mucous membrane, leaving a depression varying in depth. The patient should be instructed to irrigate it after each meal, especially if in the lower jaw, where food is more liable to be retained. The opening becomes gradually shallower until it entirely disappears.

If prosthetic appliances to replace missing teeth are supplied at once they must be so constructed that they do not interfere in any way with the healing process and will not be a hindrance to the patient's effort to keep the wound clean.

CASE REPORTS.

Si. A man about sixty-five years old, complained of having a discharge with an offensive odor in his mouth. Examination showed a sinus in the third molar region on the left side of the mandible. The second and third molars were missing. The second molar had been extracted a short time before, but this did not improve the complaint.

Roentgen examination by means of a small film showed a dark area at the root of the first molar, but no impacted tooth. A large plate was then taken, which is reproduced in Figure 4. This shows a large dark area extending to the lower border of the mandible and almost to the angle of the ramus. The area is surrounded by a distinct light line, the typical picture of a cyst. The wisdom tooth is found near the angle of the jaw. Diagnosis—Dentigerous cyst, infected from the mouth. Operation advised, but refused by the patient.

W. W. A boy nine years old. His mother first noticed a swelling in the left upper side of the jaw in the cuspid region about one year previous to the consultation. She thought it was the cuspid about to erupt. There was no pain or soreness. A little later the first temporary molar started to feel tender. It was filled, treated, and refilled by a dentist, and finally fell out. A few weeks ago a slight swelling on the left side of the face was noticed and his physician referred him back to his dentist, who sent him to the writer. Physical examination revealed little besides the swelling on the face. The alveolar process showed no signs of a cyst. Roentgen pictures, however, revealed a large dentigerous cyst containing an unerupted cuspid, apparently encroaching somewhat on the maxillary sinus and being located between the alveolar process, the nasal cavity and the palatal process. (Figure 5.)

The operation was performed at the Newton Hospital, a general anesthetic being used. After extraction of the temporary cuspid, brown fluid, containing cholesterin crystals, escaped through the incision. A large semicircular incision was made on the gum and the cyst sac removed. The permanent cuspid at first could not be detected, but was finally located in the nasal wall and could be taken out easily after some of the overlying bone was cut away. The cyst had no connection with the antrum or nose. The wound was dressed in the usual manner and the flap fixed to the bottom of the cavity by means of a dressing of iodoform gauze. The left upper first bicuspid, which was about to erupt, was left in the jaw, although part of the root was exposed. The healing process was uneventful and after a few days the patient was dismissed with instructions to wash the cavity with a syringe after each meal. One month later, when the boy was seen again, about two-thirds of the cavity had filled in with healthy granulation tissue.

R. W. A boy sixteen years old. The patient noticed a swelling under his upper lip for several months, the left upper lateral and central incisors being somewhat tender to touch. His dentist opened the left upper lateral incisor, removed the pulp and treated the root canal. Whenever the root canal dressing was removed a yellowish fluid escaped from the tooth. The root canal treatments failed to help the condition and the gum was lanced several times without result. The patient was sent in for consultation on November 8, 1918, at which time a roentgen picture (Figure 6) was taken, and from this and the clinical evidence a diagnosis of cystic odontoma was made and an operation advised.

This was performed with conduction anesthesia. The teeth involved, namely, the left upper central, lateral and first bicuspid were extracted; then a U-shaped incision was made on the labial part of the gum. The mucous membrane and periosteum were levated, exposing the bone, which in this place was very thin. Removal of the entire outer bony wall of the cyst exposed the cyst sac, from which the fluid had escaped when the teeth were extracted. It still contained, however, a large, solid calcified mass, clearly shown in Figure 6. The sac, with its contents, was completely removed, the mucous flap was pressed into the bottom of the cavity and held in place by a packing of iodoform gauze.

Pathological examination showed a fibrous membrane, infiltrated with leucocytes and plasma cells and lined with simple epithelium. In this was contained the odontoma, consisting of a mass of tooth germs and more or less well-formed rudimentary teeth; also a small amount of newly formed bone. (Figure 17.)

The healing process was uneventful and the cavity, which was very large at first, has almost completely disappeared in less than a year.

M. E. H. The two incisors had been devitalized and crowned a long time ago, there being no other history whatever. Routine roentgen examination revealed a large radicular cyst. The film in Figure 7 shows a cyst cavity involving three teeth, a central incisor with partial root canal filling, a lateral incisor with good root canal filling and a cuspid with no signs of root treatment. The latter tooth had probably become involved only recently, through lateral extension of the lesion.

The teeth were extracted and the cyst sac removed *in toto,* as in the previous cases.

J. A. H. Young woman complaned of tenderness in the bicuspid region of the upper jaw. The right upper first bicuspid, a dead tooth, had been extracted previously without giving the patient relief.

Roentgen examination showed a small cystic cavity. The apex of the cuspid was seen to protrude into it. It was, however, closely connected with the alveolar socket of the extracted tooth. (See Figure 8.)

Diagnosis: Small radicular cyst, due to infected first bicuspid, previously extracted.

H. H. Young man; complained of pus discharged from sinus on gum over right upper lateral incisor. The central incisor had been extracted and a bridge was constructed to supply the tooth.

Roentgen examination showed a cystic cavity, partly connected with the socket of the extracted tooth and the apex of the lateral incision protruded into it. The tooth showed no signs of root canal treatment, but the pulp was probably infected.

Diagnosis: Suppurative radicular cyst. Treatment was started by removal of the infected pulp and sterilization and filling of the root canal. A roentgen film, which was taken at this stage, is shown in Figure 9.

Under conduction anesthesia an incision was made, and after removing the cyst sac, the apex of the tooth which protruded into the cyst cavity was amputated. After application of iodine, a blood clot was allowed to fill in and the wound was closed by suturing. A roentgen picture, taken after four months, showed complete filling in of bone.

G. H. H. This patient had a swelling and a sinus, which discharged pus on the gum over the front teeth. The teeth had been devitalized and treated seven years before and the swelling had been noticed for about seven months. He stated that an opening had appeared two weeks previous to the consultation and a large amount of pus-like fluid had escaped. A roentgen film (Figure 10) shows a large radicular cyst, into which extend the apices of the two upper left incisors. The operation consisted of extraction of the teeth and cutting away of the alveolar septa to give access to the cyst; the sac was removed with curettes. The wound was irrigated until it filled in with healthy granulation tissue.

H. G. Man of middle age; gave a history of having periodical headaches over the left eye. His dentist removed the pulp from the first bicuspid and extracted the second bicuspid, without improving the condition. On examination a hard swelling was found on the side of the upper jaw. A roentgen film (Figure 11) showed a large cyst cavity with a cuspid and bicuspid involved. A large amount of pus-like fluid could be aspirated through the socket of the extracted tooth. Diagnosis—Infected radicular cyst.

After extraction of the cuspid and bicuspid and removal of the outer, bony wall of the cyst, the sac could be removed. The cavity was found to extend a considerable distance into the maxillary sinus. The bony wall, separating the sinus from the cyst cavity, was perforated in one place, but the membrane lining the antrum was intact. The gum flap was pressed into the cavity with an iodoform dressing. Later the cavity was left open, the patient being directed to irrigate it. The healing process was normal and the patient, when seen seventeen months later, said he had been entirely relieved of the headaches since the operation.

C. E. B. Middle-aged woman; complained of indefinable dull pressure in the right side of the upper jaw. At times she noticed discharge of pus on the gum, which, for a while relieved the pressure. Several teeth had been extracted at one time or another, with only temporary relief. Examination showed a large swelling on the entire right side of the hard palate. A yellowish fluid was released when the alveolar process was punctured through the socket of one of the extracted teeth. Roentgen examination by means of films and large frontal plates revealed an enormous cystic cavity in the palatal and alveolar processes of the upper jaw, encroaching on the maxillary sinus to a considerable extent. The cyst was probably caused by the infected teeth, previously extracted, and was a true radicular cyst of extremely large dimensions. (See Figure 12.)

The operation was performed under a general anesthetic at the Brooks Hospital. The three teeth involved were first extracted; then a large incision was made along the alveolar ridge, from the tuberosity to the median line. The palatal mucous membrane was elevated, with the periosteum attached, after which the thin bone, which caused the swelling of the palate, was entirely removed. As most of the alveolar process had been absorbed, an enormous cavity remained, extending way into the antrum. Great care was taken to leave the tuberosity intact, in order to facilitate the wearing of a plate. After removal of the cyst sac the palatal and buccal mucous membranes were turned into the cavity and fastened with two or three sutures, being brought into contact with the bone by means of a large packing. The patient was dismissed after five days, with directions as to the care of the wound. When seen again after three months, the cavity had already filled in to a surprising extent and six months after the operation the healing had advanced so far that a prosthetic appliance could be constructed.

N. L. Middle-aged man; stated that three weeks before the consultation his face had become swollen on the side of the nose and under the eye. There was no pain, but a great deal of inflammation, so that finally his eye closed up. A sinus had formed and was discharging pus below the inferior border of the orbit. Roentgen examination (Figure 13) showed a large cavity in the upper jaw and a lateral plate, which was taken at the same time revealed a bulging of the entire infraorbital surface of the maxilla. Three teeth were involved. A diagnosis of radicular cyst with suppuration, due to secondary infection, was made. The operation exposed an extremely large cystic cavity extending to the nasal wall, the floor of the orbit and the maxillary sinus. There was, however, a bony wall separating it from the antrum. The healing process was rapid and uneventful.

C. B. G. Had suffered dull pain in lower jaw for seven years and at present has numbness in left side of lower lip and a bad taste in the mouth. Had several roentgen pictures taken, but no cause was found. Further roentgen examination showed a large cyst in the ramus. In the negative, a characteristic white line was seen surrounding the lesion. A very dark area was revealed in the region of the post-molar triangle. After an incision was made over the post-molar triangle, a perforation of the bone was revealed, which appears in the roentgen picture as a very dark area, about the size of a pea. The bone over the post-molar triangle was cut away, and a large cyst cavity, involving the ramus from the sigmoid notch to the lower border, was exposed. The cyst sac communicated with the socket of the wisdom tooth and contained a great deal of pus and cholesterin. The patient was again seen after three years, and a new roentgen showed complete healing. The symptoms had entirely disappeared.

J. T. G. Patient complained of a tender place on the outside of the face, especially noticeable when shaving. Roentgen examination showed a large cyst cavity probably originating from an abscess on the right lower first bicuspid, both the neighboring teeth having become involved. A small area, still darker in the roentgenogram, was seen immediately under the second bicuspid. (Figure 14.) The operation was performed under conduction anesthesia. The cyst cavity was found to be filled with pus, containing cholesterin and lined by a membrane, which was covered with epithelium. The cyst was located between the two bone plates, in the outer one of which there was a perforation, showing in the roentgen picture as the small dark area under the second bicuspid. This is the place where the patient felt the tenderness.

J. C. F. Patient was unusually well until about a year before he was referred for examination of the mouth, when he broke down after a severe attack of the grippe, the symptoms being principally those of a nervous collapse. He was in the South for two months and then returned to work. Had been examined at Johns Hopkins Hospital and was obliged to give up work again and spend about six months in the mountains. While there he had some palpitation and dyspnoea, and was evidently very anemic. For some years he suffered from hemorroids, and on August 17, 1916, was operated upon. Dr. Locke, who took care of him at this time, found the following result of a blood examination: Haemoglobin, 70%; leucocytes, 10,000; red count, 3,000,000. A smear showed a slight degree of achromia. On August 28 the blood count was: Haemoglobin, 85%; leucocytes, 6,000; red count, 5,300,000. On September 18, 1916, the blood count was as follows: Haemoglobin, 85%; leucocytes, 7,000; red count, 5,120,000. The patient at this time had recovered from the operation entirely, and seemed in much better health. The white count, however, seems to have increased again and the red count to have decreased. Roentgen examination showed a large periodontal cyst of the jaw and abscesses about the roots of two or more teeth. About sixteen years ago the patient had had an acute abscess on the left lower first molar, which had to be extracted. A little piece of the root of this tooth was apparently left, and is seen in the middle of the cyst. (Figure 15.) The operation was performed on October 4, 1916, under a general anesthetic. After opening into the cyst, pus which was evidently under pressure, escaped at once. The bone cavity was lined with the usual cyst sac and contained the apex of the first molar. The cyst apparently was developed from the abscess which had occurred years before. The result was very satisfactory. Dr. Locke's report showed the following blood count on October 11: Haemoglobin, 92%; red count, 5,500,000. The patient has been seen several times during the past three years. He has been perfectly well ever since, and the condition of the mouth is perfect.

T. K. Patient complained at various times of an inflammation of the gum under a bridge in the lower jaw. Her dentist had lanced the gum several times. On examination the bridge was found to extend from the second bicuspid to the third molar, and one of these teeth was suspected of causing the trouble. The gum around the bridge was hypertrophied, and pus could be pressed out from a sinus. Roentgen examination (Figure 16) showed that the two bridge abutments were perfectly healthy teeth with normal pulps. A large cavity in the bone between the two teeth presented in the roentgen picture the typical appearance of a cyst. Diagnosis was made of infected radicular cyst. The guilty tooth apparently had been extracted years before, leaving a blind abscess, containing epithelium, or else the cyst was present at that time, but not discovered during examination.

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THE MINOR RÔLE OF THE CONDUCTION APPARATUS IN SLOWLY PROGRESSIVE DEAFNESS.*

BY FRANCIS P. EMERSON, M.D., BOSTON,

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THE function and relative importance of the conduction apparatus, given a normal end organ and normal hearing, is well understood. The physics of sound production, transmission and perception in health obey definite laws that are accepted by all aurists in principle, if not in detail. The object of this paper is to ask your consideration to the relation of the conduction apparatus to certain pathological conditions that have resulted in, or are causing, deafness.

Our present conception of the etiology of non-suppurative deafness has been influenced by the gradual differentiation of the function of the perception and conduction apparatus. Among the many questions that could not logically be explained by attributing to the conduction apparatus the cause for the progressive loss of hearing through interference with the sound waves, was the difficulty in accounting for the upper part of the scale *always* being lost first. This was usually accompanied by tinnitus that is labyrinthine irritation. Again, in progressive deafness there was a tendency for the hearing test to become equal, until by the time the low limits had been raised to about 512C^2 the Rinne and low limits would not vary even a few seconds for the two sides. It was not conceivable that the pathology of the Eustachian tube and middle ear could result in equal loss of function in so many cases. Third, when suppuration had resulted in the destruction of the membrana propria, with necrosis and sloughing of the malleus and incus, it was observed that in many cases the hearing was exceptionally good, especially if the process was of the fulminating type. At times, even sound perception might be painfully acute, although the conduction apparatus was disorganized. This leaves only the stapes. Is this indispensable to normal hearing? If we have an immovable stapes with a normal end organ this condition, if it were possible, would not preclude fairly good hearing for the spoken voice. When the stapes become fixed in the open window, a sthe result of fibrous bands formed during the course of a chronic non-suppurative otitis media, the perception apparatus has been functionally impaired long before the stapes loses its mobility. When fixation of the stapes is accompanied by profound deafness there is also an associated perception deafness that is more important than the condition of the oval window. It is then outside the conduction apparatus that we must look for the real cause in progressive loss of hearing. In the experience of the writer there is no such thing as a pure conduction deafness. In every case of deafness, in whatever category you may classify it, there is diminished tone perception from the beginning. It is this impairment of tone perception that is the important problem in any attempt to arrest or restore lost hearing. Lastly, it is common knowledge that nerve deafness frequently follows acute and chronic systemic poisons and that certain drugs in full dosage have a disastrous effect on the organ of Corti. These findings make it necessary to reconstruct our otologic concept to conform to the newer pathology, or, as so often happens, confirm our clinical findings but explain the etiology in accordance with our recent views. It is true that certain types of infection show inflammatory reaction that in one case is confined to the mucous membrane, in another to the fibrous tissue and in still others to the osseous elements as end results. These manifestations of involvement of the middle ear are of secondary importance, however, as compared to the question of damage, temporary or permanent, to the organ. Let us take the nomanclature of the last International Congress and try and interpret it along these lines. In the child obstructed with adenoids, or the adult with tubo-tympanic catarrh, the deafness is not due so much to the closure of the Eustachian tube and the interference with the conduction apparatus as such, but rather that the closure of the tube is followed by absorption of air in the middle ear, indrawing of the membrana tympani, inpaction of the stapes in the oval window and labyrinthine disturbance. This is accompanied by tinnitus and a loss of tone perception in the upper part of the scale which is functional for a time, but is ultimately followed by nerve degeneration. To be sure, in a child with adenoids, the low tone limit may be raised temporarily. This becomes normal, however, as the Eustachian tube opens, but the loss in the upper tone limit continues if the loss of hearing is progressive. When, therefore, in a case of chronic catarrhal otitis media the low limits are again raised, the upper limits have been markedly cut down. This would indicate that the progress of chronic deafness was not because of increasing obstruction in the middle ear, but because of further impairment of tone perception.

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* Read before the American Laryngological, Rhinological and Otological Society, at Boston, June 3, 1920.

In those cases of (O.M.C.C.) chronic tubo-tympanic catarrh we find not only that the upper tone limits were lost first, but that where the course has extended over a number of years there may be also areas of tone deafness with the lower limits unchanged. These findings are accompanied by a ground glass appearance of the membrana tympani, loss of the light reflex and indrawing. Where the changes in the membrana tympani were characteristic there was no question as to diagnosis. There was a type of case, however, that did not show changes in the membrana tympani and where we were accustomed to find a clean nasopharynx. These cases were classified as catarrhal adhesive otitis media, or, if the deafness was pronounced with changes in the bone conduction, they were called by some, beginning otosclerosis. It was not uncommon to find typical changes on one side and a clear membrana tympani on the opposite side and yet the hearing, after a number of years, might be almost identical. This type of case, whether atypical chronic catarrhal otitis media or not, begins with loss of the upper tone limits and tinnitus. There may or may not be areas of tone deafness. As the disease progresses the hearing gradually tends to become the same on both sides, the tinnitus becomes more high pitched and there may or may not be vertigo. The progress of the disease is not, in the judgment of the writer, influenced very much by the changes in the conduction apparatus. The primary step is a closure of the tube causing intra-labyrinthine changes in the perception apparatus and a raising temporarily of the low limit. The process in the Eustachian tube may then run its course and yet the deafness goes on, influenced by the acute exacerbations of a toxic focus, *i.e.,* after the deafness is once established it is progressive not because of increasing mechanical obstruction from adhesions, tissue thickening or bony deposits in the conduction apparatus, but because of loss of tone perception from damage to the end organ, from the reaction to a definite chronic infection. That the upper conversational limit is first impaired has been confirmed by the audiometer of Dr. Dean.

Silent areas occur so often in non-suppurative otitis media that the hearing test may be misleading. If we happen to test our bone conduction with a fork corresponding to the silent area it would, of course, not be heard or be transmitted to the other side. Even an approximately correct conclusion in regard to hearing cannot be reached without using all the forks from 96^a to $2048C^4$, nor without several tests by the same observer in a given case. As before stated, the upper part of the scale is lost first, and, as we would expect, both air and bone conduction are lowered for certain forks unless there is a concurrent middle ear. for sound waves, produced by the striking of a given fork, are registered in the same part of the perception apparatus, whether passing through a media of air or bone. It follows, then, that with no obstruction in the middle ear any lowering of bone conduction must be accompanied by a lowering of air conduction for the same fork. On the other hand, any obstruction in the middle ear would raise the bone conduction and lower the air conduction for forks below $512C^2$. The higher the fork required to register a lowering of bone conduction the better the prognosis (Miss C. G.). The hearing test alone with all the forks is the only guide in estimating the remaining function in any given case of deafness. This is only a help, for no hearing test and no aural examination now known can tell us whether nerve degeneration has actually commenced. The evidence increases that while we may have pure nerve deafness we never have pure conduction deafness; the fact that some nerve impairment exists in every case of deafness was not recognized, as in the usual tests we rarely resorted to all the forks. The loss of the upper register, whose lower limit is roughly indicated by the whispered voice, is then *prima facie* evidence that the deafness is due to damage to the end organ.

Inspection of the membrana tympani gives us no information as to the function of hearing, neither does it enable us to form any conception as to whether we can hold out any hope for the future. The immobility of the membrana tympani, malleus or incus, areas of atrophy, or even the absence of the membrana propria, do not justify a gloomy prognosis nor give much information that is helpful to the patient. These are end results and unless we have some definite pathology that explains the different steps that have led up to this condition and can determine whether the cause is still active, we are not in a position to do the patient any good.

Etiology. From the experience of the writer the primary infection, so far as the deafness is concerned, is usually in the lymphoid tissue. In children, primarily, in tonsil and adenoid infection. In adults, without regard to age limit, usually in the tonsils, especially the supratonsillar fossa, with secondary involvement of the surrounding lymphoid tissue, especially in the pharynx. These foci date back to the infectious diseases and are subject to repeated exacerbations. Even when there is obvious sinusitis or bony necrosis in the mandible, in the majority of cases there had been a preceding chronic infection in Waldeyer's ring, which apparently started in the tonsil. The lymphatic connection between the supratonsillar fossa and the middle ear is direct, and there is usually a history of sore throats as a child but none of late years.

Prognosis. The writer is willing to admit that he does not know from the first examination whether an advanced case will improve or not. It all depends on the amount of damage to the perception apparatus. The membrana tympani, malleus and incus may be gone and the promontory bare, and yet if this was the result of a sudden explosion of a virulent infection the nerve function would be but little impaired. On the other hand, the membrana tympani may appear almost normal with a progressive secondary nerve atrophy so far advanced that the case is beyond help. It is rarely the case that one ear (usually the one last infected) does not improve. We have much to learn in the treatment of those cases whenever degeneration has actually commenced. After the cause has been removed, whether we can, in these advanced cases, reclaim any lost function by auditory reëducation electricity, the use of strychnine, etc., is still an open question. The removal of toxic foci thoroughly must always be an individual equation. The war experience has taught us that much can be done by perseverence in restoring lost function. In the judgment of the writer, no department of otology offers so much encouragement or so large a field of usefulness as the treatment of slowly progressive deafness.

Treatment. Treatment of the Eustachian tubes, either by bougies or inflation through a septic field, is never justifiable as a routine and never does any good in chronic cases. It can readily be understood that anything causing a secondary pharyngitis would have a bad effect on the hearing. As a matter of fact, the writer has never seen marked improvement in hearing in chronic deafness from any treatment that did not include freeing the supratonsillar fossa of infected tissue, whether this be in patients of ten or sixty-five years of age. Do not try to increase the mobility of the ossicles or pay any attention to the conduction apparatus except to free it of infection. Remember that toxic products are being constantly thrown into the circulation and that the perception apparatus suffers first from toxemia and then from nerve degeneration. In a certain number of cases the writer believes that after all sources of re-infection have been removed much can be done by reëducation of the perception centers. That is, the central end organ does not seem to interpret the sound waves on account of functional disuse. On the other hand, it looks as though the highly specialized nerves, like the nerve of hearing, when degeneration has commenced, was uninfluenced by treatment. Experience has shown that very many cases given up as hopeless, on account of nerve degeneration, were only functionally crippled. These cases will improve with no other treatment than removal of the cause of the deafness. Moreover, these cases are not unusual, for it is the exception if one ear or the other does not gain if the low tone limit is unchanged.

B. O.M.C.C.

S. S., 8 years. School. December 27, 1919. P. H.—T & A operation at Massachusetts General Hospital three years ago. Measles two months ago and since then she has been deaf, with ringing in both ears..

Examination: Ears, A.D.—Membrana tympani indrawn. Dull. No thickening. Ears, A.S.—Membrana tympani indrawn. Light reflex present but not clear. Pharynx—Epipharynx blocked by a large adenoid. Sinuses—Transillumination clear except over ethmoids. Diagnosis—Infective O.M.C.C.

R		*L*
2/25	W.V.	2/25
14/6	R 256C	16/6
—	W	—
64	L.L.	64

Treatment—Adenoid removed under gas.

February 14, 1920—Has had a cold for two weeks.

R		*L*
25/25	W.V.	25/25
20/9	R 256C	15/7
	$W > +$	
40/13	512C^2	45/18
62/22	1024C^3	40/20
22/7	2048C^4	18/10
32	L.L.	32

(Hearing tests made by A. M. A.)

Result: This case improved in hearing distance twenty-three feet without politzerization or any direct treatment of the ears. The noise still continues.

Terminal stage in a case of slowly progressive loss of hearing extending over twenty years.

Mrs. R., 52 years, married. P. H.—Always well. No history of acute infections. Under constant treatment directed especially to the tubes by a competent aurist. No history of vertigo or tinnitus. A. U.—Ground glass appearance. L. R. gone. No areas of atrophy or thickening. No stapes fixation.

Examination: Transillumination negative. No pus in nares. M. M. normal. Septum straight. Breathing free. No infection. Pharynx—Lateral pharyngitis marked but whole pharynx shows a low-grade pharyngitis. Tonsils—Cryptic tonsillar disease and muco-pus in both. Pharyngeal secretions changed and patient gets up every morning to clear her throat and sometimes during the night. P. S.—The chronic focal infection in the tonsil, low-grade pharyngitis and infection of the lymphoid tissue in the mouth of the tube followed by deafness, would seem obvious.

R		*L*
Shout	W.V.	Shout
7/15	R 512C^2	5/15
	$W > +$	
—	Galton	—
256	L.L.	256

1024C^3 faint in A.D.
2048C^4 not heard in A.D.
2048C^4 faint in A.S.

Fulminating case with great damage to middle ears. Marked improvement in hearing (without inflation), because the perception apparatus was not injured sufficiently to be followed by nerve degeneration.

Miss C. G., 28 years. B. Sweden; single; salesgirl. Ref., Dr. N. P. H.—Measles 4 years. Aural discharge from both ears until 15 years old. Then T & A operation and ears were dry until six months ago. Has colds every winter with swellings under jaws and soreness back of ears. No general illness since the measles, but does not feel strong.

Examination: A.S.—O.M.S.Ch. A.D.—Eff. O.M.S. Ears examined by Dr. C. T. P.

Considerable tonsil tissue in supra-tonsillar fossae containing mucopus. Transillumination negative. Band passing from left Eustachian tube to posterior pharyngeal wall. Low-grade pharyngitis.

R		*L*
Shout	W.V.	11/ 2/25
27/45	R 512C^2	28/46
	$+ < W$	
256	L.L.	256
N	U.L.	N
R		*L*

A.S.—Directly ahead promontory is covered with granulations of watery pink color. The membrana tympani is entirely absent in the posterior half. Posteriorly can be seen niche of round window. Anteriorly and above remains of malleus. Shrapnel's membrane is covered with grayish membrane. Slight discharge. Diagnosis—O. M. S. Ch.

A.D.—Dry. Horse-shoe shaped perforation involving entire portion of membrana tympani up to anterior and posterior ligament. Malleus intact with lower end tied down to promontory by band of adhesions. Underneath posterior superior border of perforation can be seen incudo-stapedial joint. Along posterior border of perforation can be seen niche of round window. Promontory is covered by mucous membrane. Tinnitus like steam. Diagnosis—Eff. O. M. S.

Treatment: Tonsillectomy at Massachusetts Charitable Eye and Ear Infirmary, October 31, 1919.

Miss C. G.

Jan. 8, 1920.

R		*L*
8/25	W.V.	3/25
7/17	R 256C	16/23
20/32	512C^2	18/30
20/33	1024C^3	21/31
14/10	2048C^4	12/7
128	L.L.	128

Jan. 19, 1920.

8/25	W.V.	4/25
12/21	R 256C	11/21
34/45	512C^2	20/40
32/20	1024C^3	45/33
16/9	2048C^4	19/9
96	L.L.	96

Feb. 17, 1920.

R		*L*
25/25	W.V.	8/25
10/19	R 256C	13/19
43/33	512C^2	35/29
42/30	1024C^3	32/27
10/16	2048C^4	7/10
96	L.L.	64
	+>W	

Feb. 24, 1920.

R		*L*
25/25	W.V.	20/25
9/15	R 256C	9/15
22/17	512C^2	15/33
	+>W	
256	L.L.	64

Result: In this case the conduction apparatus, if compared to a chain, has two or three links missing in its most vital part. The left ear still has a scanty discharge. The patient has had active ear involvement from childhood until 28 years old, and yet the right ear gained 25 feet in four months and the left 19 feet. No inflation at any time. After removal of the tonsils the accompanying infection in the pharynx and tube was treated as long as improvement continued. (Hearing tests made by A. M. A.)

B. O.M.C.C. (Infective.)

September 27, 1919. Miss R. A.; 23 years; in college; home, California. P. H.—For six to eight years catarrhal colds. Last year throat infections. T & A two years ago. Rheumatism in arms and shoulders at fourteen years. Measles at seven years. Four years ago A. D. commenced to be deaf. A. S. one year later. No tinnitus or vertigo. Thinks hearing is not so good as one year ago.

Examination: A. D.—Membrana tympani dull and indrawn. L. R. broken. A. S.—Membrana tympani indrawn. L. R. faint. No areas of atrophy or thickening. Palate pale.

R		*L*
3/25	W.V.	2/25
32	L.L.	32
18/32	R 512C^2	22/37

Treatment: Infection cleared up. No *inflation* or any direct treatment of the ears.

R		*L*
25/25	W.V.	25/25
12/21	R 256C	10/18
27/16	512C^2	28/15
25/35	1024C^3	26/39
14/7	2048C^4	11/17
	W>+	
64?	L.L.	32

Result: From the first test one would hardly have expected the hearing to return to almost normal. The whispered voice improved from three feet to twenty-five feet.

The tonsils were removed two years ago but apparently she had no after treatment for the epipharyngitis and tubes.

Miss A. M. C.; Nov. 26, 1919; single; 38 years. P. H.—Puffing tinnitus in right ear for seven years. Much worse for last two or three years. Slight vertigo. No history of aural discharge. Deafness has gradually developed. Has had an impacted molar removed. Tonsils and adenoid operation; also had tonsillar crypts burned with cautery recently. Duration of deafness uncertain.

Examination: A. D.—O.M.C.C. M.T.—Dull, indrawn. L. R. broken. A. S.—O.M.C.C. M.T.—Dull, indrawn. L. R. broken.

X-ray of sinuses shows slight increase in density over the right antrum. The left ethmoid cells are hazy. Teeth negative. Throat—Low-grade pharyngitis. Tonsil remains, especially in upper part of fossa. Muco-pus present.

Operation December 30, 1919. Fenway Hospital. Tonsillectomy. Right antrum found negative.

Feb. 2, 1920.

R		*L*
11/2/25	W.V.	4/25
0/7	R 256C	0/7
—	W	—
13/33	512C^2	13/26
13/37	1024C^3	25/35
18/9	2048C^4	14/10
512	L.L.	128

March 2, 1920.

R		*L*
1/25	W.V.	25/25
7/8	R 256C	8/7
	W>+	
14/22	512C^2	17/31
26/15	1024C^3	31/39
5/8	2048C^4	7/7
256	L.L.	96

(Hearing tests made by A. M. A.)

Result: In the right ear the lower limit was reduced from 512 to 256. The left ear gained 21 feet for the whispered voice and the low limit was reduced from 128 to 96.

N. H. B.; 42 years; mill superintendent, Maine. January 22, 1920. P. H.—Weight, 210 pounds. Nose broken when a child and deflected to the right. Deformity includes the bony framework. Deviation of septum to right occludes that side completely. Any nasal irritation is now followed by lacrimation, anterior nasal discharge and redness of the nose accompanied by sneezing. Sleeps with his head raised and cannot stand much cold air. Has been growing deaf for seven years. Cannot hear his watch in the right ear by air conduction. Does not consider that his right ear is of any use in conversation. Two sisters are deaf. No general illness.

Examination: A.D. — Membrana tympani dull and indrawn. L.R. broken and faint. A.S.—Membrana tympani indrawn. L.R. faint. No areas of thickening or atrophy. A.U.—Stapes movable.

R Shout	W.V.	*L* Shout
N	U.L.	N
0/10	R 256C	7/12
	W>+	
2/16	$512C^2$	4/16
27/15	$1024C^3$	22/14
15/5	$2048C^4$	9/5
512	L.L.	256

Treatment: January 31, 1920. Operation at Brooks Hospital: (1) Submucous resection of septum. (2) Refracture of nasal bones and correction of external deformity. (3) Tonsillectomy.

Result: In twenty-five days the hearing for the whispered voice in the *right* ear (which he considered of no use to him for conversation) had gained 25 feet and the low limit had changed from 512 to 256. The left ear had improved three feet. No inflation used. (Hearing tests made by A. M. A.)

Feb. 24, 1920.

R		*L*
25/25	W.V.	3/25
5/10	R 256C	5/8
	+<W	
12/16	$512C^2$	5/11
26/18	$1024C^3$	22/30
15/7	$2048C^4$	11/3
256	L.L.	256

(Hearing tests made by A. M. A.)

CONCLUSIONS.

1. There is always a nerve element in every case of so-called conduction deafness of the progressive type.
2. The prognosis in regard to restoration of hearing is dependent upon the perception and not upon the conduction apparatus.
3. Toxic deafness and that due to beginning nerve degeneration cannot be differentiated by any aural examination.
4. Silent areas or islands of deafness are quite common in O. M. C. C.
5. The etiological factor is usually active in the lymphoid tissue as a chronic infection with acute exacerbations.
6. In some cases of long-standing deafness it would seem necessary to reëducate the aural perception centers by exercises, after all sources of infection have been eliminated.

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ANNUAL MEETING OF THE AMERICAN MEDICAL ASSOCIATION.

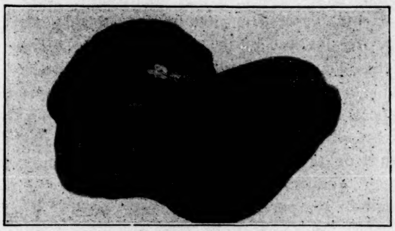
THE annual meeting of the American Medical Association will be held in Boston during the week beginning Monday, May 30, 1921, in conjunction with the annual meeting of the Massachusetts Medical Society.

Clinical Department.

A CASE OF HAIR-BALL IN STOMACH CAUSING ACUTE ABDOMINAL SYMPTOMS SUCCESSFULLY REMOVED AT OPERATION.

BY WYMAN WHITTEMORE, M.D., F.A.C.S., BOSTON.

THE following case is reported on account of the acute abdominal symptoms caused by a hair-ball in the stomach. Cases of hair-ball in the stomach are not extraordinarily rare but I have failed to find one reported that caused acute symptoms requiring immediate operation.



HAIR BALL OF STOMACH REMOVED AT OPERATION. WEIGHT, 212 GMS.

C. S., a girl 13 years old, West Surgical No. 235404, entered the emergency room of the Massachusetts General Hospital February 29, 1920, having been sent to the hospital with the diagnosis of acute appendicitis. Family History—Negative. Past History—Always well, strong and active up to the present illness. Appetite good and bowels regular. Habits—For a year or more she has been in the habit of pulling hair from her head winding it about her finger and then sucking her finger. Her mother does not know whether or not she swallows hair and the child denies it. Present illness—One year ago she began to have periodic attacks of pain in her stomach which she localized near the umbilicus. These attacks were associated with nausea and vomiting. They occurred about every two or three months, lasting a week. There has been no fever at any time, nor any blood from mouth nor with stools. Between attacks there has been almost constant pain in her stomach which was worse when she moved about and disappeared when she lay down. Mother has noticed loss of weight and vigor for the last year. She has not played as much as usual.

The present attack is the most severe of any which she has had. Yesterday she was apparently as well as usual until 2 P.M., when she returned from an errand and suddenly had very acute pain in the abdomen which doubled her up. Her doctor was called and sent her immediately into the hospital. The pain has been constantly severe and she has vomited several times.

Physical Examination. Poorly developed and nourished child, in some pain but not severe. Skin dry and pale. Hair—Matted and unkempt; scalp dirty. Eyes—Pupils react to light and distance. Nose and Ears—Negative to external examination. Mucous Membranes—Pale. Mouth—Teeth poor, upper incisors broken and carious. Pyorrhea present. Tongue—Heavily coated, protruded in midline without tremor. Throat and Tonsils—Negative. Neck—Small glands in both sides of neck; thyroid not enlarged. Chest—Long and narrow type; expansion equal; breasts undeveloped. Heart—Normal in size and position, no murmurs or thrills, sounds rapid, regular and of good quality. Abdomen—Considerably distended, tympanitic throughout, marked tenderness and spasm in left upper quadrant. There is a questionable but indistinct mass in the left upper quadrant. Otherwise negative. Genitalia and extremities negative. Reflexes negative. Temperature 101, pulse 116, respirations 30. Blood pressure 120/70. White blood count 23,600. Red count 2,764,000. Urine—Normal, cloudy, acid, 1.030, albumen negative, sugar negative. Sediment negative except for large number of epithelial cells. X-ray shows immobility of left diaphragm with respiration.

Immediate operation seemed advisable and the pre-operative diagnoses considered were first, an intussusception, this being based largely on the questionable mass felt. Second, acute appendicitis with the appendix on the left side. Third, a perforation of the stomach from a mass of hair in the stomach, but although this possibility was discussed it was not considered very seriously.

Operation. A high left rectus incision was made and on opening the abdomen a little pale fluid escaped. The anterior wall of the stomach was adherent to the abdominal wall high up. On breaking through the adhesions there escaped a little thick cloudy fluid from which a culture was taken. In this adherent area the stomach was covered with a fibrinous clot which was easily wiped away from the stomach. A large, hard mass, which was somewhat movable, was felt inside the stomach. An incision three inches long was made into the stomach transversely and a hair-ball, about the size and shape of the inside of the stomach, was removed. The opening into the stomach was closed in the usual way. A small miller wick was placed to where the fibrinous clot had been and the abdominal incision closed. The culture showed no growth.

The patient made an uneventful recovery following operation, except for otitis media which she developed twelve days later. She left the hospital 20 days after operation.

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Book Review.

The Sympathetic Nervous System in Disease. By W. LANGDON BROWN, M.A., M.D., F.R.C.P. London: Henry Frowde, Hodder and Stoughton, Ltd. 1920.

In response to the interest displayed in the Croonian Lectures delivered before the Royal College of Physicians of London in 1918, the author of *The Sympathetic Nervous System in Disease* has expanded and re-arranged that material in this volume. The book does not contain a detailed account of the anatomy of the autonomic or vegetative nervous system, nor does it describe in detail the reaction of the autonomic system to disease; rather has the attempt been made to emphasize the main plan of the autonomic nervous system and to illustrate its relations to such a few large groups of disease as affections of the endocrine glands, of the digestive and circulatory systems, and glycosuria. The author presents a careful consideration of the close interaction of the endocrine glands with the sympathetic nervous system and with the reproductive organs, explaining the relation of these functions to emotional response of the nervous system and to the influence of emotion on structure. Brief reference is made to such questions as the relations between psychic conflicts, shocks, and strains to the automatic level of the nervous system. The text includes physiological and clinical data helpful in drawing conclusions on this subject. The book is illustrated by plates and diagrams, and contributes valuable information to the subject of the unconscious mind.

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THE next annual meeting of the Massachusetts Medical Society will be held in Boston, Tuesday, May 31, and Wednesday, June 1, 1921.

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BOSTON MEDICAL AND SURGICAL JOURNAL

126 Massachusetts Ave., Cor. Boylston St., Boston 17, Massachusetts

THE RESPONSIBILITY OF PHYSICIANS IN REPORTING NOTIFIABLE DISEASES

THE importance to the public and to the profession of reporting notifiable diseases seems to be unappreciated by a great many physicians and surgeons. An article published in a recent Public Health Report has called attention to the negligence of the profession in this regard and has discussed the reasons why reports should be made. It is fair to say that no disease has been placed on the notifiable list arbitrarily or by chance, but each one has been added for some definite reason. The efficiency of public health work is determined to a considerable extent by the completeness of the information contained in reports and statistics pertaining to preventable diseases. A knowledge of the prevailing diseases, of the number of cases, of the rapidity of spread and of conditions favoring their spread is the basis of public health work, and is of inestimable value not only to the immediate community but often to districts at a considerable distance from the source of infection. Where there is no local health department, State officials not infrequently are called to assist in the control of outbreaks of disease of which no cases have been reported—a lack of coöperation which results in a considerable delay in applying preventive measures; furthermore, the reporting of diseases from communities in which there is no local health department gives tangible evidence of the need of one. The reporting of certain diseases is particularly neglected for various reasons; influenza, for instance, is often ignored on the ground that health authorities can do nothing about it; German measles, because of its mildness and supposed harmlessness; and venereal diseases, because they are, by some, considered to be private matters. It is not to any health officer, director, or health department employee that the physician is primarily responsible in the reporting of disease, but to that great principle for which every board of health stands—The Prevention of Disease.

* * *

SPECIAL EDUCATION IN OTO-LARYNGOLOGY.

IN order to raise the standard of specialization in ear, nose and throat diseases, there has been formed a committee representing the American Medical Association and other societies connected with this branch of medicine, to recommend the curriculum which should be regarded as the minimum of preparation for those who seek to become specialists in oto-laryngology. The lack of adequate education on the part of those who claim to be specialists in this subject has been disclosed by the experiences of the office of Surgeon-General in attempting to secure for the American Army a service in oto-laryngology which should equal that of the other sub-departments of medicine.

The committee has emphasized in the first place the importance of a thorough knowledge of general medicine on the part of those who undertake to make skilful diagnoses and treat patients suffering with affections of the ear, nose, or throat; this knowledge can be acquired either by practising as a licensed practitioner for four years or by serving as an interne in a Class A general hospital, for at least one year. Possessing this qualification, the candidate should then prepare himself further by pursuing the following course in the post-graduate department of a university: anatomy of the head, neck and chest, embryology and histology, one hundred credit hours; pathology and bacteriology, one hundred credit hours; operative work upon the cadaver, one hundred credit hours; physics, thirty-two credit hours; physiology, thirty credit hours; neurology, twenty credit hours; hygiene and public health, ten credit hours; reading of radiographic plates, knowledge of the teeth, mouth, and their diseases; and general surgical technique. These subjects, with the exception of the last, should be considered from the point of their bearing on oto-laryngology. Such a course requires four to five hours daily for a period of six to nine months, and the candidate is advised to spend the remaining portion of each day in attendance upon an out-patient clinic in oto-laryngology.

Upon the completion of the above course, it is recommended by a committee that the candidate should serve, for a period not less than sixteen months, as interne in a hospital especially devoted to diseases of the ear, nose, and throat, or in a general hospital possessing an adequate oto-laryngological service. This course should be recognized as a minimum preparation for the practice of oto-laryngology; in order to rank among the leading specialists, further study of the subject either on this continent or abroad is necessary.

The committee hopes to be able to assist in the following ways those who may be desirous of becoming specialists in oto-laryngology: by securing from the post-graduate departments of the universities a suitable degree, to be conferred only upon such candidates as have followed the above course; by correspondence with the post-graduate departments of the universities, with a view to securing a uniformity in the course of study to be pursued; by arranging with hospitals to limit their appointments, as internes, to those candidates possessing adequate qualification; by preparing a list of hospitals to which candidates may safely be recommended to apply for the position of interne; and by securing reliable information as to the facilities offered by various centres, which they may place at the disposal of those who desire to perfect themselves still further in any department in oto-laryngology, after the above course has been concluded. The profession is urged by the committee to give earnest consideration to this matter.

MEDICAL NOTES.

J. Dejerine Foundation.—The pathologico-anatomic collecton of Dr. Dejerne and a fund yielding one hundred thousand francs annually, the gift of Mme. Auguste Klumpke, widow of Professor Dejerine, has been accepted by the dean of the medical faculty of the University of Paris. There will be established a museum of neurology, including a laboratory, which will bear the name of the J. Dejerine Foundation.

Gift of the Rockefeller Foundation to France.—An anti-tuberculosis organization which has been developed by the Rockefeller Foundation in the Department Eure-et-Loire at a cost of four million francs has been given into the complete control of France. There are included in the organization twenty-four dispensaries, four complete isolation services, a departmental sanitorium and a modern departmental laboratory. This system will be used as a model by the other departments of France. The Rockefeller Foundation is assisting the French people in their campaign against tuberculosis in thirty-eight of the eighty-seven departments and probably will continue its assistance for the next fifteen months or two years. The Foundation has also started among the children of the Eure-et-Loire Department an organization known as the Modern Health Crusaders, a system of child education which has for its object the prevention of tuberculosis by the thorough teaching of hygiene.

Award of Medal to Sir Almroth Wright.—The first award of a gold medal established through the gift of an anonymous fellow of the Royal Society of Medicine and open to medical practitioners throughout the world, has been made to Sir Almroth Wright.

Award of the Bisset Hawkins Memorial Medal.—The triennial Bisset Hawkins memorial medal for distinction in public health has been awarded to Dr. W. H. Hamer, medical officer of health to the London County Council.

BOSTON AND MASSACHUSETTS.

Dr. S. Burt Wolbach's Work on Rocky Mountain Spotted Fever.—The valuable work which has been published recently by Dr. S. Burt Wolbach on Rocky Mountain Spotted Fever has been deservedly noted in a recent issue of *The British Medical Journal*. After first summarizing the subject briefly, the article mentions that Dr. Wolbash has brought forward evidence that the parasite responsible for the disease has three definite morphological types: the initial form in infected ticks is a relatively large extranuclear, delicately staining rod without chromatoid granules; the next is an exceedingly small rod with chromatoid granules, and is seen in nuclei in sections of ticks, and rarely in the smooth muscle cells of blood vessels in mammals; and the final one is a relatively large lanceolate paired form, apparently rich in chromatoid granules—this is the form transmitted in the tick to mammals, and is that found in their blood and lesions; it is probably a resting or slightly more resisting stage. Dr. Wolbach's monograph describes also the clinical course of the disease in man and some other aspects of his research, such as experiments to prove the specificity of the parasite, investigation of its properties, and the features of the infection in experimental animals.

Week's Death Rate for Boston.—During the week ending December 11, 1920, the number of deaths reported was 197 against 220 last year, with a rate of 13.17 against 14.41 last year. There were 28 deaths under one year of age against 31 last year.

The number of cases of principal reportable diseases were: Diphtheria, 64; whooping cough, 20, scarlet fever, 31; typhoid fever, 4; measles, 26; tuberculosis, 43.

Included in the above were the following cases of non-residents: Diphtheria, 6; scarlet fever, 5; typhoid fever, 2; tuberculosis, 7.

Total deaths from these diseases were: Diphtheria, 5; whooping cough, 2; scarlet fever, 2; tuberculosis, 11.

Included in the above were the following nonresidents: Scarlet fever, 1; tuberculosis, 3.

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THE NORFOLK DISTRICT MEDICAL SOCIETY.

A regular meeting of the Society will be held at Masonic Temple, 171 Warren Street, Roxbury, Tuesday, December 28, at 8.15 p.m. Telephone Roxbury 56089.

PROGRAM.

The Neurotic Patient and Her Point of View.
Miner H. A. Evans, M.D.
Types of Feeblemindedness in Children.
Joseph I. Grover, M.D.

Bradford Kent, M.D., *Secretary*.

Correspondence.

IN RE: SURGERY VERSUS CANCER.

Rochester, N. Y., 17 November, 1920.

Mr. Editor:—

Much has been made of the drop in the cancer death rate in the United States in the year 1918. The drop represents nearly two per 100,000 living population as compared with the cancer death rate of 1917 (1917 rate, 81.6; 1918 rate, 79.8). Enthusiasts pointed out that at last we are beginning to see the fruits of our efforts to induce the public to bring their cancers early to the surgeon for removal. "Early operation cures cancer" is, and for years has been, the burden of our public educational program concerning cancer. Stimulated by the showing of 1918, our efforts have been more strenuous than ever during the past two years.

In the Boston Medical and Surgical Journal of March 13, 1919, appeared an article designed to show that removal of cancers and of precancerous lesions, *per se*, is futile so far as curing cancer and lessening the death rate from cancer are concerned. The points made in that article have never been refuted, so far as I know, unless the cancer death rate for 1918 be considered a refutation; and a refutation seems to be demanded if we are to persist in attacking cancer by our present method.

But how about those 1918 figures? Alas! What short memories have the optimistic cut-'em-out-early advocates! Neither does one swallow make a summer nor does a single year's drop in the cancer death rate herald the beginning of cancer control. It ought not to be necessary, though it seems to be, to allude to the fact that now and then there is a temporary drop in the cancer death rate in some part of the civilized world, but that on the whole and over a period of years, the rate is gradually rising everywhere in the civilized world. In this country the rate in 1910 was 76.2 and in 1911 it was 74.3 (all figures in this article are for the Registration Area of the United States). Again, in 1905, the rate was 71.4 and in 1906 it was 69.1—in each case a greater drop than that of 1918. But please observe the general trend shown in the following table:

Cancer Death Rate per 100,000 Population.

1900	62.9
1901	64.3
1902	65.1
1903	68.3
1904	70.2
1905	71.4
1906	69.1
1907	70.9
1908	71.5
1909	73.8
1910	76.2
1911	74.3
1912	77.0
1913	78.9
1914	79.4
1915	81.1
1916	81.8
1917	81.6
1918	79.8

And now the figures for 1919 are published—80.5! "'Tis true 'tis pity, and pity 'tis 'tis true." Can it be possible that surgery earlier and oftener had nothing to do with the reduction in the cancer death rate in 1918? Obviously surgery neither claims nor can claim at the present time any credit for the similar and greater reductions noted in 1906 and in 1911. Records from Johns Hopkins, Boston, and elsewhere show that we delivered our cancer patients to the surgeons earlier in 1918 than we did in former years, yet in 1900 the cancer death rate was 62.9 and in 1919 it was 80.5—the cancer death rate increases faster probably than the surgical treatment of cancer increases and right along with the increase in surgical treatment. Not that the increased surgery causes the increased cancer death rate, but the fact remains that surgery has proven itself impotent to check the steadily increasing cancer death rate. The surgical treatment of cancer is based upon the assumption, obstinately held to in face of abundant proof to the contrary, that cancer in its beginnings, at least, is a purely local disease. If cancer is not a local disease, then treatment based upon the assumption that it is a local disease is necessarily impotent. In any case, our present treatment is a demonstrated failure. If there is any doubt upon this point the following bit of evidence, novel so far as I know, may be added to the already overwhelming mass of evidence showing the failure of our present methods in the treatment and prevention of cancer.

Cancer is one of a very suggestive group of diseases which among civilized peoples, and among civilized peoples alone, have a very high and a steadily increasing death rate—a death rate which may be always very closely forecast and which varies little from year to year, the variation usually being a slight increase. All this is curiously shown in the following table. The novel feature is the inclusion in the table of the percentage of total deaths caused by cancer.

	1914	1915	1916	1917	1918	1919
Total death rate per 100,000 population	1360.0	1330.0	1400.0	1420.0	1800.0	1200.0
Cancer death rate per 100,000 population	79.4	81.1	81.8	81.6	79.8	80.5
Percentage (of total deaths from all causes) of the cancer deaths	5.8	6.0	5.8	5.7	4.4	6.3

The curious thing to be noticed is that invariably the percentage of deaths due to cancer rises when the general death rate falls, and falls when the general death rate rises, and almost in mathematical proportion to the rise and fall of the general death rate in each case. The explanation is simple: besides being always high and gradually increasing, the cancer death rate never fluctuates very much from one year to the next. Other diseases may or may not have a very large mortality now and then and may vary within wide limits in incidence from year to year, thus affecting the general death rate more or less, but the cancer death rate may always be relied upon to furnish a large number of deaths each year, which number may always be closely foretold. For example, the general death rate for 1918 was tremendously high owing to the severe epidemic of influenza in that year but the cancer death rate remained at about the usual figure, so that the percentage of deaths from all causes furnished by cancer was unusually low. On the other hand, the general death rate for 1919 was the lowest on record, but cancer ran true to form and furnished its usual quota, thereby making its percentage figure the highest on record. What has just been said about cancer applies, likewise, to the other members of the suggestive little group of diseases referred to already but that matter cannot be considered in this article.

I suggest, not with malice toward the surgeons, an explanation of the 1918 drop in the cancer death rate. There must, of course, be some explanation if the activity of the surgeons in treating cancer by removing cancers is ruled out. May it not be possible that a considerable number of individuals who otherwise would have died from cancer in 1918 died from influenza first (the writer has considerable Irish blood) and were so reported on the death certificates? There were nearly 500,000 deaths in 1918 from influenza and pneumonia, and among these 500,000 there may have been some cancer patients. This explanation, at least, has more merit than some others.

The usual objection offered to an article of this kind is: "What good or useful purpose can destructive criticism serve unless something better than the thing criticised is also presented?" More specifically: Why criticize our present method of attacking cancer, particularly when that method is everywhere accepted by medical authority as the one logical method offering any hope for the eventual control of cancer?

It is precisely because the method is authoritatively accepted and universally taught that I criticise it without offering anything to take the place of the thing criticised, even though I could. It is hopeless to attempt to induce honest authority even to consider any plan other than its own when it believes its own plan to be not only correct but the only possible correct plan. Before it will change its opinion, honest authority must be convinced that its opinion is wrong. If and when, it is so convinced, honest authority will immediately abandon its untenable position whether or not there is in sight another position which is tenable. If not convinced, honest authority will obstinately and rightly hold to its opinion and will rightly ignore any other. The first thing to be done, then, is to convince authority that it is in the wrong and thus clear the field for the growth of right. Whether the truth be ready at hand or not, as to the nature of cancer and its correct point of attack, medical authority will cease advocating as the sole possible preventive and cure of cancer the early and complete removal of precancerous lesions and of cancers the moment it is convinced that such removal *per se*, is a proven failure, not here and there, but always and everywhere. Because the truth is not evident is no excuse at all for holding to and advocating a proven untruth.

I respectfully urge anyone interested to study the article spoken of (BOSTON MEDICAL AND SURGICAL JOURNAL, March 13, 1919). I also urge a serious pondering of a great and solemn referendum as to the efficacy of our present method of controlling cancer, to wit: cancer death rate 1900, 62.9; 1919, 80.5.

S. W. LITTLE.